A STUDY TO DETERMINE THE EFFICACY AND SAFETY OF LIMBAL CONJUNCTIVAL AUTOGRAFT TRANSPLANTATION (LCAT) IN THE SURGICAL MANAGEMENT OF PTERYGIUM

DISSERTATION SUBMITTED FOR

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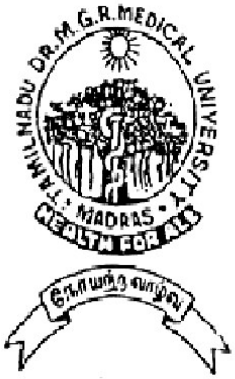

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CERTIFICATE

This is to certify that this dissertation entitled **" A STUDY TO DETERMINE THE EFFICACY AND SAFETY OF LIMBAL CONJUNCTIVAL AUTOGRAFT TRANSPLANTATION (LCAT) IN THE SURGICAL MANAGEMENT OF PTERYGIUM "** is the bonafide original work of **Dr.RAJALAKSHMI.M.C.,** in partial fulfilment of the requirement for M.S., (Branch III) Ophthalmology examination of the Tamil Nadu Dr.M.G.R Medical University to be held in March 2010.

Dr.A. SULAIMAAN, M.S.,D.O.,
Head of the Department
Department of Ophthalmology
Madurai Medical College,
Madurai.

DECLARATION

I, **Dr.RAJALAKSHMI.M.C.,** solemnly declare that this dissertation **" A STUDY TO DETERMINE THE EFFICACY AND SAFETY OF LIMBAL CONJUNCTIVAL AUTOGRAFT TRANSPLANTATION (LCAT) IN THE SURGICAL MANAGEMENT OF PTERYGIUM "** is a bonafide record of work done by me in the Department of Ophthalmology, Madurai Medical College , Madurai under the guidance of **Dr.A.SULAIMAAN, M.S.,D.O.,** Head of the Department, Department of Ophthalmology, Madurai Medical College, Madurai.

This dissertation is submitted to the Tamilnadu Dr.M.G.R.Medical University, Chennai in partial fulfillment of the University regulations for the award of M.S Degree (Ophthalmology) Branch-III, Examination to be held in March 2010.

Place: Madurai

Date: **(Dr. RAJALAKSHMI. M.C.)**

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CONTENTS

INTRODUCTION

Pterygia, the wing shaped fleshy growth on corneal limbus have been known to physicians for thousands of years. Sushrutha (Circa 1000 BC) has recorded pterygium removal. The term pterygium meaning wing (pteryx – wing) was introduced by Walton in 1875. Despite being recognised for many years, very little is known about about its pathogenesis.

It has been accepted for sometime now that environmental factors are responsible for development of pterygium. More recently, it has been clear that UV light exposure is most important environmental influence. Majority of pterygia occurring on nasal limbus has been attributed to the fact that reflected sunlight is preferentially focused at this point. But exact way in which UV light interacts with limbus and cornea to produce a pterygium is unknown.

Genetic factors also are important. In particular environments some racial groups are more affected than others and there is tendency for pterygia to occur in families.

Histopathology is nonspecific and does little to suggest an underlying cause. The usual picture is that of hyaline degeneration and low grade inflammatory reaction.

Surgical excision remains principle mode of treatment for pterygium. Various techniques have been tried like simple excision, Bare sclera method, Transplantation of head of pterygium, mucous membrane or conjunctival graft or flap to cover bare sclera and Lamellar keratoplasty. Unfortunately none of these techniques are successful in all cases and recurrence still remains most enigmatic complication of pterygium excision.

Many approaches have evolved as an alternative to or adjunctive to surgical excision. Ionising radiation, heat, laser, antimetabolites etc. have been advocated as adjuncts to surgery. Many of these techniques have either been unsuccessful or associated with serious complications.

In recent years, focus has shifted to use of planned surgical repair with a flap of normal conjunctiva or limbus in treatment of pterygia. Improved results with this form of repair have encouraged the implication of limbal stem cells in aetiology and pathogenesis of

pterygia. These cells are responsible for corneal epithelial regeneration and transdifferentiation and serve as a barrier to prevent conjunctival ingrowth onto cornea.

Localised damage to limbal stem cells at nasal or temporal limbus can be caused by UV light or other environmental factors. Damaged limbal stem cells lose their barrier function & allow conjunctival ingrowth. Furthermore they may release vasoproliferative substance that encourage pterygium formation.

According to this new concept , pterygium develops due to focal deficiency, absence or aplasia of limbal stem cells & therefore transplantation of limbal stem cells is considered as the most convincing approach for treatment of pterygia.

HISTORICAL REVIEW

Pterygium has been recognised from ancient times dating back to 1000BC. The first person to record it is Susruta. Since then Celsus (29AD), Paul (600AD), Avicenna (1037AD) and others have described it in detail. This simple appearing, easily removable lesion is sometimes a challenging one because of high rate of recurrence.

It appears that for about 30 centuries, man has tried to conquer pterygium. They tried various forms of collyrium of lead, zinc, copper, iron, bile, women's milk, vinegar, cuttlefish bone, lead acetate, silver nitrate etc as medical treatment. Sushruta has recorded a pterygium removal.

" With the patient in recumbent position on an operating table, the pterygium is loosened & disturbed by sprinkling powdered salt into the eye ; with the patient looking laterally, a sharp hook is used to secure the growth at its loosened upturned part…the pterygium is got ridden by scratching it with a sharp round topped instrument. Any remnant of the pterygium should be removed with a scarifying instrument to prevent recurrence.

Sushruta's technique suggests that even in ancient times, the problems of pterygium management were recognised. Apparently, care

was taken to remove any tissue remnants in the hope that there would be no recurrence.

For a long time, the pterygium was considered to be a type of pannus from which it was differentiated by Chelsius (1839). Von arlt (1854) proposed an inflammatory basis for occurrence of pannus & suggested that it is a result of corneal ulcer.

Hasner Edlem Von Artha & Schreiter suggested a neoplastic aetiology (1847). Later it was thought to be due to disturbances of venous circulation in anterior ciliary veins (Winther, Von Hippel /1866) or due to disturbances of extraocular muscles (Theobald 1887) or eyelids (Bond 1889).

An association with the ultraviolet rays in solar radiation has been found the most significant environmental factor (Cameron 1964).

Attempts at local medication such as by application of solid choline chloride was evaluated by Beard and Dimitry(1945). Anastasi (1953) had treated the condition with topical use of steroids or subconjunctival injection of hyaluronidase. According to Helgers (1960), it stimulates rather than inhibit growth.

Scarpa (1802) was the first to perform a kind of bare sclera excision. Excision with simple closure of the wound was advocated by Von Arlt (1850-74). Terrien brought pterygium growth upward to upper

fornix. Knapp (1868) bisected the growth and pulled upper half superiorly and lower half inferiorly. A lamellar corneal graft applied to denuded area of cornea after excision was suggested by Magitot (1916).

Bare sclera method in which after excision, a small area of sclera in relation to affected area of cornea is not covered by conjunctiva, but is thoroughly denuded of subconjunctival tissue was described by D'ombrain (1948).

Beta radiation (King 1950), X-rays, Argon laser (Caldwell 1985) have been tried as adjuvants to surgical excision to prevent recurrence. Topical instillation of antimitotics was tried by Mecham (1962). In 1963 Kunimoto & Mori first used Mitomycin C to treat pterygia.

Free tissue grafts to cover bare sclera was introduced by Klien (1876) by using mucous membrane grafts. Hobby (1888) mobilised adjacent conjunctiva. As early as 1926, Elschnig as well as Spaeth used free conjunctival grafts in treating pterygia (Duke Elder). Recently Barraquer (1980), Dowlut and Laflamme (1981), Vastine and associates (1982) as well as others have repopularised the use of conjunctival autograft transplantation in the management of pterygia with high success rate.

Recently the inclusion of limbal tissue in conjunctival graft has gained popularity. Srinivas et al (IJO 1998) have reported the importance of including the limbal tissue in the conjunctival graft for prevention of recurrence.

EPIDEMIOLOGY

Pterygium has worldwide distribution. More common in warm, dry climates. It has got a equatorial prevalence of 22% and less than 2% in latitudes above 40deg.

A large case control study in Australia identified number of risk factors for development.

- 44 fold greater relative risk of pterygium development for persons living in tropics (< 30deg latitude).
- 11 fold for working in a sandy, outdoor environment, 9 fold for patients without a history of wearing spectacles or sunglasses.
- 2 fold for those who never wear a hat.

In Northern climates, it is exclusively confined to fishermen and rural workers. Taylor & colleagues found a statistically significant association between UV light exposure (both UV-A & UV-B) and development of pterygium in a larger group of Chesaparke Bay fishermen. From these studies, relationship between UV radiation & pterygium formation is obviously strong.

UV exposure may not be the only factor. Punjabi workers exposed to dusty, indoor environment had higher prevalence of pterygium than who experienced higher level of outdoor UV radiation.

One study among welders exposed to higher levels of UV light show direct relationship between length of employment & incidence of pterygium . In contrast, more recent study found pterygium to be rare (<0.5%) among welders.

Local drying of cornea and conjunctiva in interpalpabral fissure from tear film abnormality can lead to new fibroblastic growth according to one theory. Increased incidence in windy, dry climates is consistent with this hypothesis.

Patients < 15yrs of age rarely acquire pterygium. Although prevalence increases with age, highest incidence occurs between ages 20 and 40. Recurrence more frequent in young adults than older individuals.

Pedigree analysis has demonstrated families with dominant mode of inheritance although most cases appear to be sporadic.

AGE AND SEX DISTRIBUTION

Men working outdoors are more affected. Males and females who worked indoors were equally affected. On the whole, pterygium occurs twice as often in men as in women. While the prevalence is highest in the elderly, development of new cases is highest between ages of 20 and 40 years.

CLASSIFICATION

Pterygium is essentially a triangular encroachment of the bulbar conjunctiva on the cornea. It is a degenerative condition of subconjunctival tissue.

A true pterygium and pseudopterygium were differentiated by Winther (1956).

- A true pterygium is a degenerative and hyperplastic process in which conjunctiva actively invades the cornea.
- A pseudo pterygium is the result of an inflammatory process and a fold of inflamed conjunctivabecoming adherent to a raw area on the cornea and being passively dragged across the cornea.

TRUE PTERYGIUM	PSEUDO PTERYGIUM
1. Degenerative & hyperplastic : Unilateral/bilateral.	Post inflammatory process : unilateral
2. Is incorporated with the corneal tissue throughout extent & firmly fixed at its apex	Adherent only at its apex
3. Found in nasal & temporal side in the interpalpabral fissure	Found on any part of corneal margin
4. Probe cannot be passed underneath	Probe can be passed underneath
5. Progressive or stationary	Regresses after treatment

According to Doherty's morphological classification, true pterygium is classified into

(1) Progressive

(2) Stationary

(3) Regressive

PROGRESSIVE PTERYGIUM

Also called pterygium crassum, vasculosum or carnosum. Is actively growing, fleshy and vascular. The neck is hyperaemic, head is voluminous and of gelatinous appearance. The borders are very much serrated and infiltrating healthy cornea and usually does not have stocker's line ahead of it. In front of head, numerous infiltrations of cornea seen.

STATIONARY PTERYGIUM

The head of pterygium looks pale and sparsely vascularised and stops growing. It losses its vascular appearance and develops a stocker's line.

REGRESSIVE PTERYGIUM

A pale, thin, papery, gray, anemic and membranous pterygium appears to be regressing, but in reality never gets smaller or disappears. Has a grey apex resembling corneal opacity. Usually seen in elderly and represent age related degenerative changes.

Gerundo classified the above said first three stages as

- Proliferative papillomatous

- Fibromatous
- Atrophic – sclerotic

In one study regarding pterygium morphology, pterygia have been classified into three grades based on the relative translucency of pterygium tissue when seen through slit lamp.

Grade T1 (atrophic) – episcleral vessels underlying the body of pterygium were unobscured and clearly distinguished.

Grade T3 (fleshy) – a thick pterygium in which the episcleral vessels underlying the body of pterygium were totally obscured.

Grade T2 (intermediate) – all other pterygia that did not fall into two categories, where episcleral vessel details were indistinctly seen or partly obscured.

Pterygium vessels were distinguished from the episcleral vessels by the straightened radial orientation of vessels seen in pterygia.

RECURRENT PTERYGIUM

Regrowth of pterygium after primary excision is called recurrent pterygium. It is a fibrovascular tissue growing onto cornea without elastotic degeneration. It involves underlying sclera, episclera and Tenon's capsule and grows onto corneal stroma, where it is firmly adherent to underlying tissue. It can cause restriction of ocular motility due to scar tissue.

Recently, Townseed classified pterygium into 5 groups depending on their risk of recurrence :

- Actively growing
- Fleshy
- Slowly growing
- Stationary
- Atrophic

SITE

Pterygium occurs mostly on the nasal part of conjunctiva (60%) being less common on the temporal side (20%). Occasionally it can be double pterygia, in same eye seen both temporal and nasal. Even in double pterygia, the nasal pterygium is most commonly the first one to occur. It can affect one or both eyes.

Various explanations have been put forth for greater predilection on nasal side.

1. The normal flow of tears is from temporal to nasal side towards the puncta. The tears carry dust particles which accumulate in the lacus lacrimalis. These concentrated dust particles may cause greater irritation of nasal conjunctiva.
2. Greater exposure of nasal interpalpabral conjunctiva to ultraviolet radiation. (Cameron 1865)

3. Presence of two ciliary arteries on the nasal side and only one on temporal side, which leads to greater hyperemia on the nasal side in response to any irritant (Wolf 1950)
4. Excess subconjunctival tissue on the nasal side when compared to temporal.
5. Greater curvature of nasal fibres of orbicularis oculi causing a greater squeezing effect upon the nasal subconjunctival tissue (Sugar 1949)
6. Greater bowing of lateral 1/3rd of upperlid and consequence protection by longer lashes (Cameron 1865).

AETIOPATHOLOGY OF PTERYGIUM

AETIOLOGY

The exact etiology is unknown.

1. Heredity and genetics

Heredity has an undoubted role in the occurrence of pterygia. Duke Elder (1965) has stated that the mode of inheritance is autosomal dominant with low penetrance. This however does not mean that every pterygium occurs as the result of hereditary factors. Pterygium can also originate as an acquired pathological condition excited by external factors. It appears possible that hereditary disposition to pterygia will only become manifest if there exciting factors.

2. Tear film and heat

In some geographic areas where pterygia are prevalent , dust, wind and excessive dessication often coexist with solar glare. Tear function abnormalities have been proposed as an etiological factor. But no abnormalities of schirmer's test, tear breakup time or Rose Bengal staining of cornea were found in eyes with pterygia compared to those without. Pterygium incidence is high in some areas of high humidity where dessication is less likely. However, Elliot (1961) has pointed out that tear drying in areas of hogh humidity can occur due to constant exposure to wind leading to devitalisation of tissues in the medial third

of the palpebral aperture. Anderson (1954) postulated a causal relationship between temperature and pterygium. Other workers have implicated infrared radiation but the evidence for this is weak.

3. Microtrauma

Mechanical irritation by dust particles, enhanced by tear flow from lateral to nasal has been proposed as a mechanism. However pterygia occur in dust free areas, for example at sea in sailors (Legwold 1983).

4. Angiogenesis factor

It has been suggested that a pterygium angiogenesis factor may exist which develops following repeated irritation at the limbus. The presence of this factor produces vascular ingrowth and formation of pterygium (WE Wong 1978). It may be that prolonged ultraviolet exposure causes biological changes in the Bowman's membrane and that altered proteins so formed could then act as angiogenic or pterygiogenic factors.

5. Immunology

IgE and IgG deposits in pterygium connective tissue stroma have been described (Pinkerton Ajo 1984). Plasma cell and lymphocyte infiltration were seen in the same areas as antibody deposits. Cell bound IgE irritant complexes may initiate the release of active pharmacological mediators from mast cells which may in turn release stimulatory factors

leading to the development of pterygium. Suggested mediators were platelet activating factor and platelet derived growth factor.

6. Miscellaneous

It has been proposed that a factor in the adult forehead perspiration, perhaps lactic acid, commences a chain of events in pterygium formation. Sweat flows along the brow, down the side of the nose and is deposited on nasal bulbar conjunctiva. This theory, however could not explain the occurrence of pterygium on situations where sweat would evaporate rapidly or in cold environments.

Other theories which have not gained ready acceptance include

- The notion that pterygium is due to a chronic infection
- That pterygium is due to thrombosis of conjunctival veins.
- That contraction of horizontal recti results in stasis in blood vessels and looseness of conjunctiva which folds itself over the cornea forming a pterygium
- That light is reflected from the skin of the nose back on to the nasal limbus.

These various theories do not provide a convincing explanation of pathogenesis, shape or location.

7. Ultraviolet rays

There is strong circumstantial evidence that exposure to ultraviolet light is important in the etiology of pterygium. As pointed out by Cameron (1965) , pterygium is most common between latitudes 40deg north and 40deg south, paralleling local atmospheric ultraviolet energy intensity. Confirmatory evidence for the involvement of ultraviolet radiation has been gained by examining three risk groups

- Those known to be exposed to high levels of ultraviolet radiation (either outdoors or occupational).
- Those with other diseases known to be induced by ultraviolet radiation.
- Subjects who may be hypersensitive to ultraviolet radiation.

A study of pterygium in rural Australians (BJO 1984) has demonstrated a strong positive correlation between climatic ultraviolet radiation and pterygium prevalence. Further evidence for the involvement of ultraviolet light in aetiology of pterygium comes from the systemic associations of pterygium. These include Basal cell carcinoma, Porphyria cutanea tarda, Polymorphous light eruption and Xeroderma pigmentosum. Although the evidence for involvement of ultraviolet light is strong, the precise mechanism by which it causes

pterygium and the predominantly nasal location cannot be explained convincingly.

8. Role of limbal stem cells

In recent years, improved results with various conjunctival autografting techniques including the limbal tissue have led to the implication of the limbus stem cells in the aetiology and pathogenesis of the pterygium.

Limbal stem cells are epithelial progenitor cells located in the basal layers of the peripheral cornea particularly at the limbus. These cells are responsible for corneal epithelial regeneration and trans differentiation and serve to replenish the loss of corneal epithelial cells through attrition and desquamation by proliferation and migration. They also serve as barrier to prevent conjunctival ingrowth onto the cornea. Of the many histopathologic features, ‘conjunctivalisation’, that is invasion of conjunctival epithelial cells onto the corneal surface is the hallmark of stem cell deficiency. It appears that pterygium may be the result of localised damage to nasal and temporal limbal cells caused either by ultraviolet radiation or other environmental factors. Damaged limbal cells besides loosing their barrier function , may also release vasoproliferative substances that encourage pterygium occurrence.

HISTOPATHOLOGY OF PTERYGIUM

Pterygium is the result of corneal rather than conjunctival disease since the first event in its formation is the appearance of minute opacities in the periphery of Bowman's membrane in the interpalpebral area. These opacities are non inflammatory and occur at points where the corneal nerves penetrate the Bowman's membrane. Following their appearance, the conjunctival sub epithelial connective tissue invades the superficial cornea fragmenting and destroying Bowman's membrane. This invading connective tissue is covered by conjunctival epithelium and is covered by many thin walled vessels.

According to Greer's ocular pathology, drying of the interpalpebral tear film is an important initiating factor in the pathogenesis of pterygium. This exposes the peripheral corneal epithelium, Bowman's membrane and the underlying corneal stroma to the destructive effects of ultraviolet radiation.

Drying of the interpalpebral tear film is most marked in the medial one third of interpalpebral fissure. Drying of tear film occurs not only in conditions of low atmosphere humidity but also when there is habitual exposure to constant wind.

Exposure to high doses of ultraviolet radiation causes nuclear fragmentation and cell death in corneal epithelium resulting in punctate

epithelial erosions stainable by 1% rose bengal stain. Repeated exposures result in formation of punctate ulcers which uncover Bowman's membrane. After prolonged exposure to ultraviolet light, holes appear in the Bowman's membrane (COLANDER DEGENERATION) beneath the areas of epithelial necrosis and underlying corneal stroma becomes edematous. These peripheral corneal changes stimulate invasion by blood vessels and fibroblasts from the limbus, hastened by such factors as chronic infection or dust which increase corneal vascularity. Subsequent organisation of this fibrovascular tissue causes traction which draws the characteristic wing of conjunctival tissue on to the cornea.

The presence of colander degeneration of Bowman's membrane and oedema of overlying stroma at the apex of the pterygium indicate that the degenerative process is still active and that pterygium is progressing.

Histopathology of pterygium is thoroughly outlined by Fuch's in 1980s. Electron microscopic findings show increased number of thickened elastic fibres, hyaline degeneration of conjunctival tissue, concretion and epithelial changes.

Austin et al summarised the features as follows:

- Hyalinasation of subepithelial connective tissue of substantia propria
- Diffuse or lobular collection of eosinophilic granular material with an associated increase in number of fibroblast and other cells.
- Increased number of thickened and tortuous fibres that stain strongly with elastic stains (elastotic material)
- Concretions within the hyalinised and granular areas that may show either eosinophilia or basophilia.

In reference to characteristic elastotic material within pterygia, the term ‘elastotic degneration’ was coined to describe the condition of tissue uptake by Weigert’s and Verhoff’s elastic tissue stains.

Historically, Hogan and Alvarado stated that elastotic material within pterygia is formed from four sources

- Degenerating collagen
- Preexisting elastic fibres
- Abnormal fibroblastic activity
- Abnormal ground substances

More recently ultrastructural analysis by Austin et al attributed the elastotic degeneration solely to abnormal fibroblastic activity with the production of abnormal maturational forms of elastic fibres. The fibroblasts originate from the limbal connective tissue. Moreover collagen degeneration was only demonstrated in subepithelial zone and accounted for light microscopic finding of hyaline degradation.

Histopathologic analysis of leading edges of pterygia by Cameron disclosed the following

1. Fibroblastic tissue separating basal corneal epithelial layers from Bowman's layer.
2. Altered orientation of basal corneal epithelial cells overlying the fibroblastic tissue. They are elevated and their normal vertical axis becomes oblique.
3. Destruction of Bowman's layer and superficial corneal stroma underlying fibroblastic tissue. Fibroblasts are found in the area of tissue destruction closely applied to the edges of Bowman's membrane. Their nuclei are elongated and irregular with numerous nuclear pores.
4. Normal corneal tissue proximal to leading edge of pterygium.

Immunohistochemical staining has demonstrated presence of altered limbal basal stem cells between dissolved edge of Bowman's layer and fibrovascular tissue of pterygia. Other histologic changes that have been identified in epithelium of pterygia include squamous cell metaplasia, acanthosis and dyskeratosis.

A recurrent or secondary pterygium is defined as recurrence of pterygium after primary surgical excision. A secondary pterygium often has more exuberant fibrovascular growth response than original pterygium. The histology findings of secondary pterygium differ from primary pterygium in that the typical degenerative connective tissue changes are absent. Cameron suggested that surgical trauma after primary excision leads to an accelerated fibrovascular proliferative response.

The cytology of surface cells overlying pterygium is abnormal typically exhibiting squamous metaplasia with increased goblet cell density. Abnormal cytology is also demonstrable in inferior bulbar conjunctiva. This suggests a graded series of ocular surface changes occurring throughout the bulbar conjunctiva with most advanced changes occurring directly over pterygium surface confirming that pterygium is indeed an ocular surface disorder.

STUDY OF CELL CYCLE KINETICS IN PTERYGIUM

A study on cell cycle kinetics in pterygia has shown that cellular proliferation is not significantly greater in pterygia when compared to normal conjunctiva. Also, cellular proliferation patterns of primary and recurrent pterygia are not significantly different from each other. The findings suggest that pterygium is not a disorder of cellular proliferation. It is probably caused by excessive production of extracellular matrix (or) by lack of enzymes such as collagenases leading to tissue accumulation. The implication of the above findings is that therapies should be directed towards regulation of extracellular matrix production rather than antimitotic approaches such as mitomycin and beta irradiation. (Cell cycle kinetics in pterygium at three latitudes BJO 1995)

CLINICAL FEATURES OF PTERYGIUM

Pterygium is a fibrovascular, wing shaped encroachment of conjunctiva onto the cornea. For the purpose of description the pterygium is divided into four parts

1. Head – the part invading the cornea from limbus
2. Apex – the most interior portion of head in the cornea
3. Body – the widest portion found on bulbar conjunctiva
4. Neck – the narrowest part, the junction of the head and the body of the pterygium.

The head and the apex are firmly blended with the cornea. The body has got attachments to the episclera, lesser than its surface area. Hence a probe can be made to pass behind the body about a mm or so but not completely underneath it.

Clinically the pterygium can be classified as follows:

1. Early pterygium – A small and fleshy pterygium with minimal encroachment on the cornea. Few corneal infiltrations may be found in front of the apex.
2. Progressive pterygium – A progressive pterygium is fleshy, vascular and occasionally may get violently hyperaemic at its head. There are infiltrations in front of the apex (FUCH'S SPOTS).

Microscopically the progressive pterygium is characterised bycolander degeneration of the Bowman's membrane (presence of holes) and edema of underlying stroma at apex of pterygium.

STOCKER'S LINE

Immediately in front of the apex, a pigmented line is seen due to pooling of tears in areas where corneal surface is irregular. Histologically iron is found within the basal epithelial cells and can be demonstrated using Prussian blue stain or Perl's test. This line is an indicator of chronicity of pterygium.

When the pterygium ceases to grow, the vascularity disappears and it appears thin,grey,anaemic and membranous but never disappears.

3. Malignant pterygium – The progression is faster so that a fleshy highly vascular growth encroaches the cornea over a larger area in a comparatively shorter duration of time. It is termed as malignant because of its exuberant growth. This is common in young individuals.
4. Atrophic pterygium – When the pterygium inducing factors are withdrawn from exerting their influences, the pterygium can stop growing characterised by reduction of vascularity, pale flat appearance and no infiltration in front of the apex. The vessels become straight due to fibrous tissue contraction. Atrophic pterygia are commonly seen in old patients with long standing pterygium.

SIGNS AND SYMPTOMS

- Many pterygia may remain asymptomatic
- Irritation, watering and foreign body sensation
- Pain may be present during inflammation
- Reduced visual acuity may be due to obstruction of visual axis or due to astigmatism

  Astigmatism : as the pterygium progresses, it causes flattening of the corneal curvature in its horizontal meridian producing an hypermetropic astigmatism of about +0.75D to +1.50D which is with the rule
- Cosmetic disfigurement
- Problems in contact lens fitting
- Restriction of ocular movements (abduction) from traction on the conjunctiva. It may lead to diplopia in some.

MANAGEMENT

Medical management has been tried from the earliest times, but found to be unsatisfactory. Topical steroids, sub conjunctival injection of hyaluronidases, cryotheraphy and lasers have been used but with little success. Currently the use of steroids is limited to the postoperative control of inflammation and fibrovascular proliferation.

Surgical excision remains the principle mode of treatment for pterygium. A variety of surgical techniques have been tried and their evolution has been based on the sole aim of preventing recurrence. The existence of a number of surgical techniques attests to the fact that no single technique has been universally successful.

INDICATIONS FOR SURGERY

1. Decreased visual acuity
   - due to encroachment into visual axis
   - induction of progressive irregular astigmatism
2. Ocular irritation and discomfort
3. Recurrent inflammation
4. Cosmetic disfigurement
5. Restricted ocular motility
6. Binocular diplopia
7. Difficulty in performing corneal refractive surgeries
8. Difficulty in contact lens fitting.

The surgical techniques have been broadly classified into

- Excisions
- Transpositions
- Plastic repairs

EXCISIONS

SIMPLE EXCISION :

It is one of the earliest methods. It was refined by Czemark and Arlt. This is the simplest method and consists of extirpation of the entire fibrovascular tissue and suturing the two free lips of conjunctiva. The technique may be used in the simplest of the cases, these being determined on the basis of annoyance to the patient rather than the nature of the pterygium.

BARE SCLERA EXCISION :

This technique was popularised by D'ombrain (1948). The pterygium was excised along with a part of the conjunctiva, leaving behind an area of bare sclera between the edge of the conjunctiva and the cornea. This technique is based on the principle that reepithelialisation of the denuded cornea will be accomplished before resurfacing of the bare scleral area by conjunctival epithelium. Though it is one of the widely used procedures, it is known to be associated with a high recurrence rate.

TRANSPOSITIONS

It was formerly thought that the head of the pterygium is the cause for recurrence. Desmarre first transplanted the head of the pterygium by carrying down into a conjunctival slit below and suturing it as a pedicle flap. Desmarre's technique was modified by Mc Reynolds.

Mc Reynolds operation consists of transplanting the head of the pterygium beneath the conjunctiva without cutting it and fastening it with sutures near the insertion of inferior rectus.

PLASTIC REPAIRS

PRIMARY CLOSURE OF CONJUNCTIVA

The idea of bringing healthy conjunctival tissue to the dissected limbal area to prevent recurrence has led to several forms of conjunctival closure

- SLIDING FLAP PROCEDURE – McCoombs et al in 1994 found this procedure in which a rectangular flap of conjunctiva is undermined and retracted down into the defect created by pterygium excision. Recent study showed 45% recurrence of primary repair
- THE MEREST SCLERA TECHNIQUE – In this, the pterygium is excised from the overlying conjunctiva and sclera, and the

superior and inferior flaps are brought together to minimize bare sclera and sutured with 10-0 nylon sutures. Recurrence rate is 2.1%. All cases were associated with graft dehiscence or infection.

- Z PLASTY – The pterygium body is directed into the defect by a V shaped conjunctival flap which itself is sutured along the limbus. Recurrence rates are high.

CONJUNCTIVAL AUTOGRAFT TRANSPLANTATION

Majoros was the first one to describe free conjunctival grafts for pterygium. Thoft and later Vastine et al. described conjunctival autografting for several ocular surface disorders such as unilateral chemical or thermal burns, irradiational injury, neoplasms, persistent epithelial defects, trauma, fornix reconstruction, cicatricial strabismus, developmental anomalies and degenerative diseases including pterygia.

Kenyon et al. (1985) described the technique of conjunctival autografting in detail and popularised it not only for recurrent pterygium but also for advanced primary pterygia. The surgical technique involves transferring a free graft of superior bulbar conjunctiva to cover the sclera exposed by pterygium excision and fornix reconstruction.

Surgical technique

- After local anaesthesia, a rigid lid speculum is used to provide maximal exposure. Stay sutures of 4’0 black silk are inserted at the 12’0 clock and 6’0 clock limbus.
- The eye is abducted maximally (assume nasal pterygium) and multiple cautery spots are used to delineate the involved area of conjunctiva to be excised.
- Beginning at the head of pterygium a disposable scarifier is used to superficially excise the involved cornea to the limbus. Spring action scissors are used for complete circumcision of the conjunctiva at the cautery marks.
- With blunt dissection, the conjunctiva and tenon’s capsule are freed from the horizontal rectus muscle. Extraocular muscles are identified with muscle hook and if necessary isolated with traction sutures. Especially in recurrent cases the muscles can become enmeshed in scar tissue and unless dissected meticulously, can be damaged or severed.
- Complete resection is done of involved conjunctiva, Tenon’s capsule and cicatrix; the bare sclera and muscle remains exposed. The adjacent limbus and cornea are polished with a diamond burr.

- Conjunctival margins are recessed to restore fornix. Conjunctiva is sutured to sclera with absorbable suture on spatula needle.
- The size of conjunctival graft required to resurface the exposed sclera is measured with calipers.
- The globe is rotated inferomedially to access uninvolved superior bulbar conjunctiva. Dimensions are marked.
- With sharp, spring action scissors the conjunctiva is dissected out as thinly as possible, leaving the Tenon's capsule and episcleral tissue undisturbed. By doing so, the donor site need not be sutured and would heal without scarring. Also, a thin graft is more elastic and heals with less shrinkage.
- The eye is abducted and the free graft is mobilised into the recipient bed. The graft is secured to the surrounding conjunctiva and episclera with interrupted sutures.

Postoperatively topical steroids and antibiotics are applied frequently. Conjunctival autografting reduces the recurrences of pterygium bt the following mechanisms

1. Conjunctival autograft taken from supero temporal bulbar conjunctiva provides less exposed conjunctiva with intact basement membrane.

2. Complete closure of the excision site with relatively normal conjunctival tissue provides a “fire break” to the proliferation and advancement of residual abnormal tissue, both conjunctival and episcleral towards and across the limbus.
3. Limbal stem cells are included in the conjunctiva and are then correctly oriented at the limbus of the pterygium excision site.

Advantages of conjunctival autograft transplantation

- Offers anatomical and physiological restoration of ocular surface
- Reduces recurrent rates
- Useful in both advanced and recurrent pterygium
- Does not require additional surgical skill or instrumentation
- Avoid serious complications of antimitotic agents or beta irradiation
- Does not require any special post operative care.

LIMBAL CONJUNCTIVAL AUTOGRAFT TRANSPLANTATION (LCAT)

Despite the established efficacy of conjunctival autografting in reducing the recurrence of pterygium, some of the studies have reported a higher rate of recurrence between 21 and 39%. It is the latest technique in management of pterygium. The technique is based on the concept that the pterygium is a localised disorder of the limbal stem

cells brought about by environmental factors. The surgical technique is similar to that of conjunctival autografting except for the fact that the limbal conjunctiva is included in the graft. Srinivas et al (IJO Vol 46, No.4 September 1998) have reported the superiority of limbal autograft over conventional autograft in preventing recurrence.

PROBLEMS AND COMPLICATIONS

INTRAOPERATIVE

- Thick graft : Thick graft results due to inclusion of Tenon's capsule along with conjunctiva. It causes graft oedema and graft rejection postoperatively.
- Incorrect graft placement : The graft may be inadvertently inverted such that the epithelium is apposed to the sclera. The graft will certainly slough off if it happens. To avoid this complication the epithelial surface should be marked with gentian violet or cautery.
- Graft orientation : The graft should be placed in such a manner that the limbal side of donor conjunctiva corresponds with the limbus of host bed.
- Inadequate graft size : If the graft size is smaller than the bare area, the sutures may cut through the conjunctiva due to excessive tension. Inadequate grafts may shrink and retract resulting in pterygium recurrence due to loss of barrier function.

- Poor quality of graft : The quality of graft may be poor in patients with previous trauma, surgery, infection, chronic inflammation, xerosis resulting in excessive fibrosis and cicatrisation.
- Excessive surgical manipulation : Excessive surgical manipulation causes drying and shrinkage of conjunctiva which may result in recurrence.

POST OPERATIVE

- Graft oedema : Graft oedema occurs due to excessive manipulation, inclusion of Tenon's capsule, poor graft orientation and haematoma of the graft. It may resolve within 2 to 4 weeks.
- Haematoma : Haemorrhage within or under the graft may occur during surgery or postoperatively. This usually occurs due to inadequate hemostasis of the episcleral and Tenon's conjunctival tissues.
- Conjunctival graft necrosis : Two main causes of graft necrosis are incorrect placement of graft and avascular scleral bed. Inverted graft becomes pale within 24 to 48 hrs and the scleral bed is exposed. Avascular scleral bed is seen in patients with previous beta irradiation.
- Conjunctival graft retraction : main causes of graft retraction are inadequate graft size, excessive Tenon's tissue and poor graft quality.

- Corneo scleral dellen : Main causes of dellen formation are excessive graft oedema and irregular surface due to excessive use of diamond burr polisher.
- Granuloma : Post operative granuloma at the donor site is fairly common. It is basically a Tenon's granuloma. Granuloma may occur at the host site also. The treatment is simple excision.
- Symblepharon : Gupta and Chen (1995) have reported symblepharon formation after conjunctival autografting.
- Corneal astigmatism
- Epithelial inclusion cysts are infrequent
- Extraocular muscle disinsertion.

AMNIOTIC MEMBRANE ALLOGRAFT TRANSPLANTATION

Panzardi first performed amniotic membrane grafting after pterygium excision in 1947.

The hyperproliferative nature of subconjunctival fibroblasts can result in fibrosis with accelerated growth of recurrent pterygium after primary pterygium removal. It is hypothesised that transplantation of preserved human amniotic membrane suppresses postsurgical fibrosis and fibroblast proliferation, lowering recurrence rate.

With advances in preservation in Dulbecco's modified Eagle's culture medium and glycerol stored in –80degree C, the problem of graft

rejection is solved. Suppression of inflammation is important in preventing scar formation and recurrence. Amniotic membrane transplantation maintains normal conjunctival epithelium which makes it superior to buccal or mucous membrane grafts.

It has been suggested that amniotic membrane transplantation is more successful in preventing recurrence if the graft is covered with either limbal or conjunctival autograft transplants. The recurrence rates with this method was from 10.7 to 15.4%.

ADJUNCTIVE TREATMENT

BETA IRRADIATION

Castroviejo was optimistic about the combination of surgical excision and adjunctive beta irradiation. Radiation causes ionization changes in both the nucleus and cytoplasm of cells. Tissues with neovascularisation and fibroblasts, which are responsible for pterygium recurrence are the most susceptible to irradiation during their peak of mitotic activity, division and proliferation. Irradiation causes obliterative endarteritis and arrest of fibroblast proliferation. Use of Strontium-90 is the safest and most effective mode of irradiation to the eye. The standard applicator delivers approximately 3000 reps per minute over its entire radiation surface. But the complications like cataract formation, keratitis sicca, episcleritis, iritis, corneal thinning, ulceration, scleral

ulceration and pseudomonas endophthalmitis occurs in high doses or repeated usage. The recurrence rates varies from 0.5% to 33%.

ANTIMETABOLITES

THIOTEPA

Thiotepa (triethylene thiophosphoramide) is a radiomimetic drug of the nitrogen mustard family. Mecham first used the drug in 1962 for recurrent pterygium as a 1:2000 (0.5mg/ml) solution every 3 hours for 6 to 8 weeks. They have their action on actively dividing cells by releasing ethylenimine radicals causing inhibition of capillary endothelial proliferation. Though reduced recurrence rates upto 4% were recorded, the complications like poliosis and periorbital skin depigmentation, especially in dark-skinned individuals has limited its usage. It is rarely used nowadays.

MITOMYCIN C

Mitomycin is an antibiotic-antineoplastic and antimetabolite agent isolated from the fermentation filtrate of streptomyces caespitosus. It selectively inhibits DNA replication by forming covalent bonds between adenine and guanine, and it is non cell specific, exerting its action primarily during the late G1 and S phases of cell division. However, rapidly dividing cells are preferentially sensitive to the effects of Mitomycin C.

Kunimoto and Mori was the first to use it in treating pterygium in 1963. It is also used in Glaucoma filtering surgery, in treatment of conjunctival and corneal intraepithelial neoplasia, in ocular cicatricial pemphigoid, in wound healing after photorefractive keratectomy, and in nasolacrimal duct surgeries.

Mitomycin C is used by two modes

Postoperative Topical MMC application:

Initially topical MMC in 1mg/ml (0.1%) after primary pterygium excision, instilled 4 times a day for 10 days caused lower lacrimal punctual occlusion, mild superficial punctate keratitis, iritis and a recurrence rate of 5% after 5months followup.

Subsequently, lower concentrations in 0.04% and 0.02% were studied with lower complications. Postoperative MMC in 0.02% dilution used twice daily for 5 days lowered recurrence rate to 2.6% in 1yr followup. The side effects encountered were avascularised sclera, ocular discomfort and lacrimation, superficial punctate keratopathy and pyogenic granuloma were all mild, self limiting and easily treated.

Intraoperative MMC application:

Conflicting results have been obtained after intraoperative application of MMC. This is due to adoption of different treatment

protocols. Some of them used higher concentrations which still caused decreased recurrence rates.

- Intraoperative application of 0.05% MMC for 1 minute along with 20mg subconjunctival depot steroid injection resulted in no recurrence after 4 to 14 months followup.
- Intraoperative application of 0.04% MMC for 3 mins decreased recurrence rate from 33% in control group to 6.7%.

Side effects and complications with topical MMC include

- Scleral thinning and perforation
- Secondary glaucoma
- Corneal perforation
- Iritis
- Photophobia and pain.

However these adverse effects were seen after prolonged and unsupervised topical administration and in some cases the concentration was much higher than recommended.

Frucht-Pery and Ilsar demonstrated that lower concentration of MMC administered over a short time increases safety without compromising efficacy.

LAMELLAR KERATOPLASTY

It is performed as an adjunctive procedure to treat recurrent pterygium. The purpose was to replace the thinned and scared corneal tissue after pterygium excision and has been used as a barrier against the regrowth of pterygium.

Magitot was the first to recommend keratoplasty in pterygium treatment (1916). Recurrence rates ranged from 5% to 55%. It has no special advantage in recurrence.

Recurrence rates with different surgical techniques for pterygia

Sl. No.	TECHNIQUE	RECURRENCE RATE %
1.	SIMPLE EXCISION	30 - 100
2.	BARE SCLERA	5 - 89
3.	AMNIOTIC MEMBRANE GRAFT	10.7 – 15.4
4.	CONJUNCTIVAL AUTOGRAFT	5 - 39
5.	LCAT	2.3 – 13.3
6.	BETA IRRADIATION	0.5 - 33
7.	MITOMYCIN C (INTRAOP)	8.3 – 23%
8.	LAMELLAR KERATOPLASTY	5 - 55

AIM OF THE STUDY

1. To study the efficacy and safety of limbal conjunctival autografting in the surgical management of pterygium.
2. To compare the recurrence rates and complications of limbal conjunctival autografting with primary conjunctival closure (Merest sclera technique) and adjuvant use of MMC (Mitomycin C) with conjunctival closure.

MATERIALS AND METHODS

A prospective randomised controlled study was done over a period of 12 months. 75 cases of pterygia needing surgery who presented to Government Rajaji Hospital, Ophthalmology Department, Madurai from June 2008 to June 2009 were entered in this study. The patients were randomly divided into three groups irrespective of their age and sex.

Group 1 :

hitherto known as the Merest Sclera group, 25 eyes of 25 patients underwent surgical excision of pterygium by Merest Sclera technique (MST).

Group 2 :

hitherto known as LCAT (Limbal Conjunctival Autograft Transplantation) group, 25 eyes of 25 patients underwent surgical excision of pterygium followed by LCAT.

Group 3 :

hitherto known as MMC (Conjunctival closure with adjunctive Mitomycin C) group, 25 eyes of 25 patients underwent surgical excision of pterygium followed by adjunctive use of MMC in bare area followed by conjunctival closure with suturing.

INCLUSION CRITERIA

- Age > 18 years
- Progressive pterygia grade T2 and grade T3
- Primary & Stationary pterygia
- Eyes with no evidence of any ocular surface disorder, any disorder of ocular adnexa or any major surgeries.

EXCLUSION CRITERIA

- Recurrent pterygia
- Atrophic pterygia and pterygia less than 2mm encroachment on cornea
- Eyes with evidence of any ocular surface disorder (eg.Dry eye) or any ocular adnexal disorders or evidence of any high intraocular pressure.

PREOPERATIVE ASSESSMENT

Preoperatively uncorrected and corrected visual acuity were recorded in all cases.

A baseline intraocular pressure measurement was done in all cases using schiotz tonometer.

A slit lamp examination was performed and a careful assessment of the morphology, vascularity and size of the pterygium was made along with careful examination of ocular adnexa and anterior segment.

The size of pterygium was recorded as millimetres of encroachment onto cornea from the limbus.

Orbital anatomy and normalcy of lid closure were noted.

SURGICAL METHODS

The patients were all operated by a single surgeon under peribulbar block with 2% lignocaine.

The merest sclera technique was done by dissecting the head of pterygium from corneal surface starting o.5 to 1mm in front of its apex with a Bard Parker knife and no.15 blade upto the limbus. Then with the aid of spring action scissors the pterygium , after its separation from overlying conjunctiva and underlying sclera by blunt dissection, was excised. Hemostasis secured by wet cautery. Then the upper and lower free ends of conjunctiva were brought together and sutured with 10-0 nylon sutures.

The adjunctive use of Mitomycin C was applied in concentration of 0.02% with cotton tipped applicator for 3 minutes in the bare area after pterygium was excised by above said method, then irrigated thoroughly with normal saline and then the conjunctival free ends were sutured over the area with 10-0 nylon.

The limbal conjunctival autograft was done after excising the pterygium as described above. Graft was obtained from superotemporal

conjunctiva after marking the graft dimensions with the use of callipers with excision starting from forniceal end. Care was taken to obtain a thin graft without button holing. Once limbus was reached, graft was flipped over the cornea and tenon's attachment at limbus was meticulously dissected. The flap was then excised with vannas scissors taking care to include the limbal tissue. Then graft was slid onto cornea without lifting and moved onto scleral bed maintaining the limbus-limbus orientation. The graft was smoothened out and secured using 10-0 nylon sutures.

The eye was then patched with antibiotic ointment.

POSTOPERATIVE CARE AND FOLLOW UP

Postoperatively topical dexamathasone eye drops was used every 2 hrs for the first postoperative week and then tapered over the next 5-6 weeks. Topical NSAIDS were used according to patient symptomatology.

After the immediate postoperative period, patients were seen at 6 weeks, 3 months, 6 months and 1 year.

During each visit patient was subject to visual acuity measurement, IOP measurement and careful slit lamp examination. A recurrence was defined as fibrovascular tissue crossing the corneoscleral limbus onto clear cornea in the area of previous pterygium excision.

ANALYSIS AND RESULTS

AGE DISTRIBUTION

AGE GROUP (IN YEARS)	NO OF CASES	PERCENTAGE
LESS THAN 30	9	12
30 - 39	21	28
40 - 49	23	31
50 - 59	19	25
60 & ABOVE	3	4
TOTAL	**75**	**100**

Out of 75 patients analysed, a total of 59% patients were in 30 to 50 years age group and 25% patients were in 50 to 59 years age group. This age distribution nearly correlates with literature stating that pterygium is more common in elderly with a increase in age groups between 20 and 40years.

SEX DISTRIBUTION

SEX	NO OF PATIENTS	PERCENTAGE
MALE	44	59
FEMALE	31	41
TOTAL	**75**	**100**

Majority of patients in the study group were men. This correlates with literature which states that pterygium is twice as common in males as in female patients. This has been attributed to the fact that men are likely to remain outdoors more often than women and have an increased risk of exposure to sunlight.

LATERALITY

EYE AFFECTED	NO OF PATIENTS	PERCENTAGE
RIGHT EYE	35	47
LEFT EYE	28	37
BOTH EYES	12	16

The pterygium was present on the right eye in 47% and on the left eye in 37% of patients. 16% had bilateral pterygium. Pterygium is most commonly a bilateral condition. One eye may follow the other by months to years.

LOCATION OF THE PTERYGIUM

SITE	NO OF PATIENTS	PERCENTAGE
NASAL	72	96
TEMPORAL	1	1.33
DOUBLE	2	2.66
TOTAL	75	100

92% of pterygia were present on the nasal side, the predominantly nasal location of pterygia has been attributed to greater exposure of the

nasal interpalpebral conjunctiva to ultraviolet radiation. 5% patients had double pterygia, which might indicate a more widespread actinic damage of the limbal cells.

SIZE OF PTERYGIUM

SIZE	VALUE (MM)
RANGE	2 – 4.5
MEAN	2.66

The pterygia included were of a mean size of 2.66mm, which are progressive and stationary primary pterygia of grade T2 and T3.

INDICATION FOR SURGERY

INDICATION	NO OF PATIENTS	PERCENTAGE
COSMETIC DISFIGUREMENT	24	32
OCULAR IRRITATION	29	38
RECURRENT INFLAMMATION	11	15
VISUAL IMPAIRMENT	11	15
TOTAL	75	100

The commenest indication for surgery in this study group were ocular irritation (38%) and cosmetic disfigurement (32%). Pterygium is commonly blamed for eye irritation, foreign body sensation,

dryness, epiphora and pruritis. They are in reality caused by underlying dry eye. Even a small pterygium may cause cosmetic blemish to the patient. Pterygium may also become inflamed causing episodic inflammation, pain and tenderness. Pterygium causes with the rule astigmatism due to horizontal flattening and also obstructs peripheral vision on encroaching near papillary aperture.

PROCEDURE

PROCEDURE	NO OF CASES	PERCENTAGE
GP 1 - MST	25	33.3
GP 2 - LCAT	25	33.3
GP 3 - MMC	25	33.3
TOTAL	75	100

All three groups had equal number of patients, 25 eyes were operated in each group.

PROCEDURE AND LOCATION

PROCEDURE	NASAL	DOUBLE	TEMPORAL
MST	23	2	1
LCAT	25	-	-
MMC	25	-	-

FOLLOW UP

The average follow up period was 6 months to 18 months. 90% of the patients were followed up for 18 months. 2 patients in Group 1, 3 patients in Group 2, and 3 patients in Group 3 were lost follow up after 12months.

RECURRENCE RATES

GROUP	NO OF EYES OPERATED	NO OF RECURRENCES	PERCENTAGE
GP 1 - MST	25	5	20
GP 2 - LCAT	25	3	12
GP 3 - MMC	25	4	16
TOTAL	**75**	**12**	

The total number of recurrences were 12 out of which 5 occurred in merest sclera technique group, 3 occurred in limbal conjunctival autograft group and 4 occurred in mitomycin C group. The recurrence rates in the three groups were 20%, 12% and 16% respectively.

TIME OF RECURRENCE

TIME	GP 1	GP 2	GP 3	TOTAL	%
0 – 6 wks	-	-	-	-	-
6 wks – 3 mths	3	1	3	7	58
3 – 6 mths	1	1	1	3	25
6 mths –12mths	1	1	-	2	17
12mths –18mths	-	-	-	-	-

58% of all recurrences occurred between 6 weeks and 3 months after surgery. 25% of recurrences occurred between 3 to 6 months after surgery. 17% of recurrences occurred between 6 months to one year. No recurrences were found before 6 weeks and after 12 months.

AGE AND RECURRENCE

AGE GPS	GP 1	GP 2	GP 3	TOTAL	%
0 - 20	-	-	-	-	-
21 - 40	-	-	1	1	8
41 - 60	5	3	3	11	92
>60	-	-	-	-	-
TOTAL	5	3	4	12	

In this study more recurrences were found in the age group of 40 to 60 years. 8% occurred in 21-40yrs age group.

COMPLICATIONS

GPOUP 1

S No	COMPLICATIONS	NO OF PATIENTS
1.	GRAFT DEHISCENCE	1
2.	GRAFT INFECTION	1
3.	SUTURE IRRITATION	1
4.	SUTURE SITE GRANULOMA	1

GROUP 2

S No	COMPLICATIONS	NO
1.	GRAFT RETRACTION	3
2.	SUTURE IRRITATION	2
3.	DONOR SITE GRANULATION	1
4.	CORNEAL DELLEN	1

GROUP 3

S No	COMPLICATIONS	NO
1.	AVASCULARITY NEAR LIMBUS	1
2.	RAISED IOP	1
3.	SUTURE IRRITATION	1

In MST group , one patient developed graft dehiscence for which suturing was done. One patient developed infection and was treated with antibiotic eye ointment. One patient had suture irritation and suture was removed. One patient had suture site granuloma which was excised and regrafting was done after inflammation subsided.

In LCAT group, 3 patients had graft retraction, 2 were in position and were followed up and one needed regrafting. One patient had corneal dellen which was due to edematous corneal graft and was treated with topical tear substitutes. 2 patients had suture irritation and suture was removed. One patient had donor site granuloma which was excised and raw area covered with adjacent conjunctiva.

In MMC group, one patient each had avascularity near limbus, suture irritation and raised IOP. Suture was removed and steroids withdrawn for raised IOP and followed up.

DISCUSSION

Surgical excision is the principal mode of theraphy for pterygia. But the high incidence of recurrence following excisiom remains a challenge unmet and a problem unsolved. The evolution of various surgical techniques & various adjuncts to surgical excision has been based on the sole aim of preventing recurrence.

The various procedures used in the management of pterygia may be evaluated on the basis of two principal criteria namely, safety (freedom from sight threatening complications) and efficacy (freedom from recurrence). Also given the widespread distribution of pterygia in the community, the procedure should be feasible enough to be performed under different clinical settings.

The recurrence rates among various surgical procedures found in this study showed 12% in Limbal Conjunctival Autograft group, 16% in Mitomycin C group and 20% in plain Merest Sclera technique group. The least recurrence rates were in LCAT group.

Merest sclera technique, which is a primary conjunctival closure shows higher recurrence rates, probably due to less number of limbal stem cells in the graft area.

A study by Prabhasawat et al. showed recurrence rates upto 45% with primary closure of conjunctiva (Ophthalmology 1997;104;974-

985). Recurrence rates as low as 2.1% with Merest sclera have also been quoted in literature. Our study showed moderately high recurrence rate with this technique. The complications were graft dehiscence, graft infection & suture irritation which can be treated.

The various adjunctive treatments include use of Mitomycin C both intraoperatively and postoperatively. There have been reports in literature with serious sight threatening complications with use of post operative Mitomycin C (Ophthalmology 1992;99;1647-54).

Intra operative use of MMC however has been associated with less complications and low recurrence rates. This study showed moderately higher rate of 16%.

Mitomycin C is an antimetabolite with radiomimetic properties. It causes suppression of development of collagen fibres in the process of wound healing. Thus it inhibits the formation of granulation tissue and regrowth of new vessels on wound surface. This can be used in aggressive and large vascularised pterygia.

Frucht- Pery reported that using MMC intraoperatively for 5 mins in a concentration of 0.02% showed recurrence rates upto 5% (Cornea 1994;13;411-13). But shorter time exposure is associated with decreased toxicity and more efficacy. Lam et al showed higher incidence of superficial melting with longer application time.

Singh G et al. reported a recurrence rate of 1.7% with intra operative use of MMC in a concentration of 0.4mg/ml (Cornea 1990;9;331-4). But higher rate of complications were associated with this concentration.

Cheng HC et al. reported a recurrence rate of 7.9% with intra operative use of MMC for 30 seconds in a concentration of 0.02% after a follow up of 27.3 months (Cornea 2001;20;1;24-9).

Demorik A et al. reported a recurrence rate of 5-9% with intraoperative use of MMC in concentrations of 0.02% for 3 minutes with no significant complications (Eur J Ophthalmol 1998;8;3;153-6). But Dougherty et al. reported one case of corneoscleral melt with similar method in a series.

The recurrence rate in this study correlates somewhat with the recurrence rates in literature. The complication of avascularity near limbus occurs later with no significant adverse effects. But the efficacy of MMC in this concentration needs long term follow up for occurrence of complications.

Frucht-Pery and Ilsar demonstrated that a lower concentration of MMC administered over shorter time increases safety without compromising efficacy.

Conjunctival autografting is widely accepted as a safe and effective surgical modality, in the treatment of pterygium but recurrence rates still vary considerably in literature upto 39%. Recently the importance of including limbal conjunctiva in the autograft has been emphasised to prevent recurrence.

The Limbal Conjunctival Autograft group in this study is the procedure associated with less recurrence rates(12%). The recent concept in pathogenesis of pterygium is localised damage to limbal cells brought about by exposure to UV rays (DJO 1997;5;editorial). The surgical procedure while removing the damaged cells replenishes the area with healthy limbal stem cells from superotemporal conjunctiva which is less exposed to actinic damage.

The importance of LCAT has been reported by Srinivas et al. (IJO 1998;46;4) .

Shimazaki et al studied role of LCAT in primary pterygium for a follow up of 10.5 months and found recurrence rates of 7.4%

Gris et al. similarly gave no recurrence rates in a study group of recurrent pterygia (Ophthalmic Surg Lasers 1996;27;917-23) .

Similarly many other studies show recurrence rates upto 9.2% over a follow up of 6-29 months with majority occurring within 6 months.

The rates in this study is significantly lower than other two groups. The post operative complications were minimal and could be managed by further simple procedures. Most of them were related to surgical technique and can be avoided by marking the epithelial surface if graft with cautery or gentian violet. Retraction and shrinkage can be avoided by taking as thin a graft as possible and by taking a graft slightly larger than bare scleral area.

With the above results, it is concluded that despite LCAT is a time consuming procedure, it is a safe and effective technique for different grades of pterygium in preventing recurrence rates with minimal complications.

SUMMARY

In this study of 75 patients with pterygia, most patients (58%) were in age group of 30-50 years. 59% of the patients in this study group were women. 96% of patients had nasal pterygium. The mean size of pterygium operated was 2.66mm. The commonest indication for surgery was ocular irritation (38%) followed by cosmetic disfigurement (32%) followed by recurrent inflammation & visual impairment (15%). The average follow up period was 6 months to 18 months and 90% of the patients were followed for 18 months. The recurrence rate was 20% with Merest sclera technique, 16% with Mitomycin C group and 12% with Limbal Conjunctival Autograft group. Most of the recurrences (58%) were found during 6 weeks to 3 months after surgery. Most of the patients who developed recurrence were in the age group 40-60years. Graft retraction was the commonest side effect following LCAT. 2 patients showed suture irritation which was removed at the end of 6 weeks. Corneal dellen formation &granulation at donor site were other complications. 1 patient developed raised IOP in MMC group which returned to normal after steroid withdrawal. Other complications were avascularity near limbus & suture irritation. Graft dehiscence, infection, suture irritation and suture site granuloma were associated with Merest sclera technique.

CONCLUSION

Limbal conjunctival autografting is a safe and effective procedure in the management of pterygium. The recurrence rate following limbal conjunctival autografting is significantly lower than that following primary conjunctival closure and adjunctive use of Mitomycin C.

The advantages of Limbal Conjunctival Autografting over other modalities of treatment are

- Low recurrence rates
- Fewer and no sight threatening complications
- Offers anatomical and physiological restoration of ocular surface
- Simple procedure not requiring additional surgical skill or instrumentation
- Cost effective
- Does not require any special post operative care.

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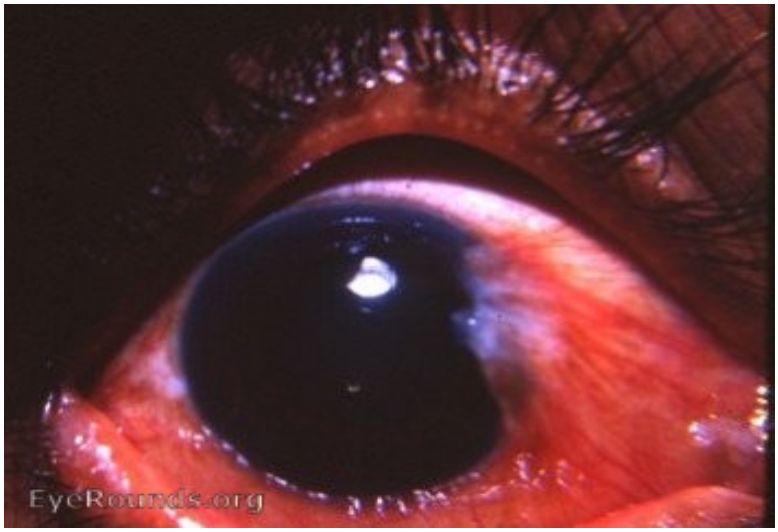
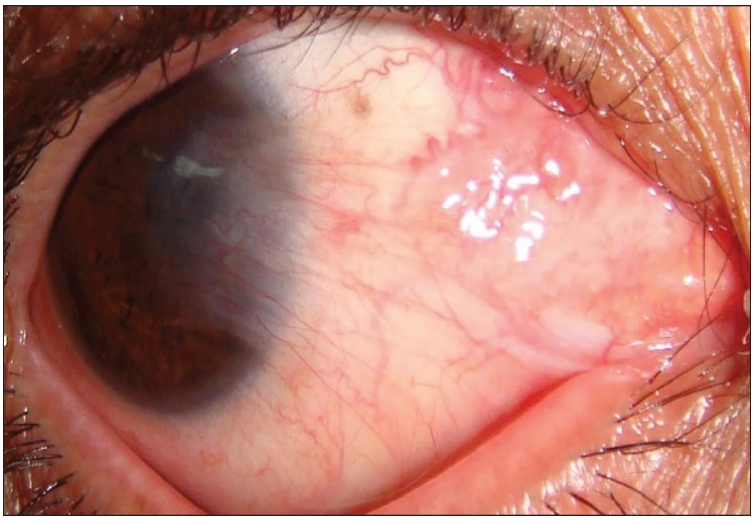
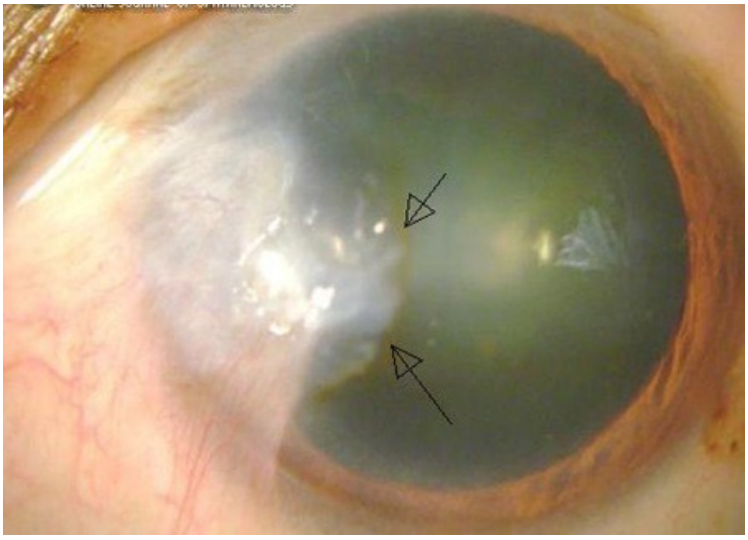
FLESHY PROGRESSIVE (GRADE T3) PTERYGIUM



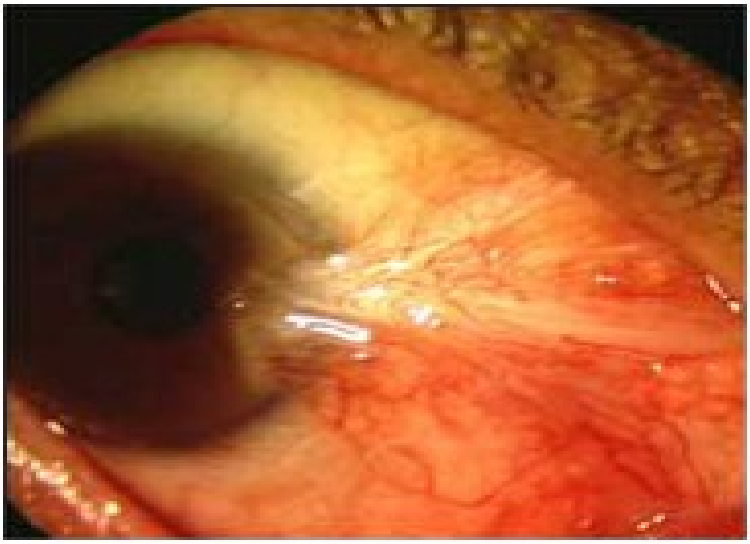
INTERMEDIATE (GRADE T2) PTERYGIUM



STOCKER'S LINE

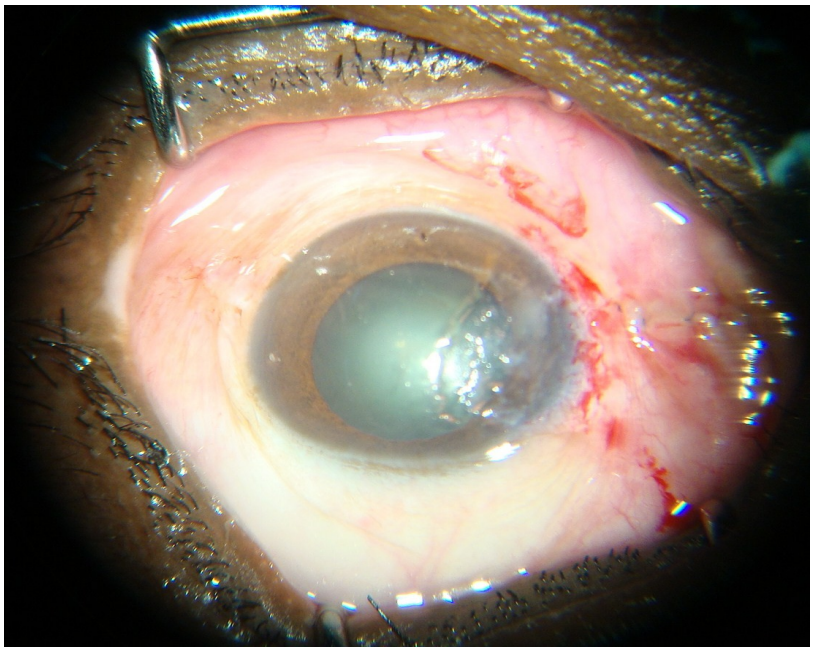


MALIGNANT PTERYGIUM

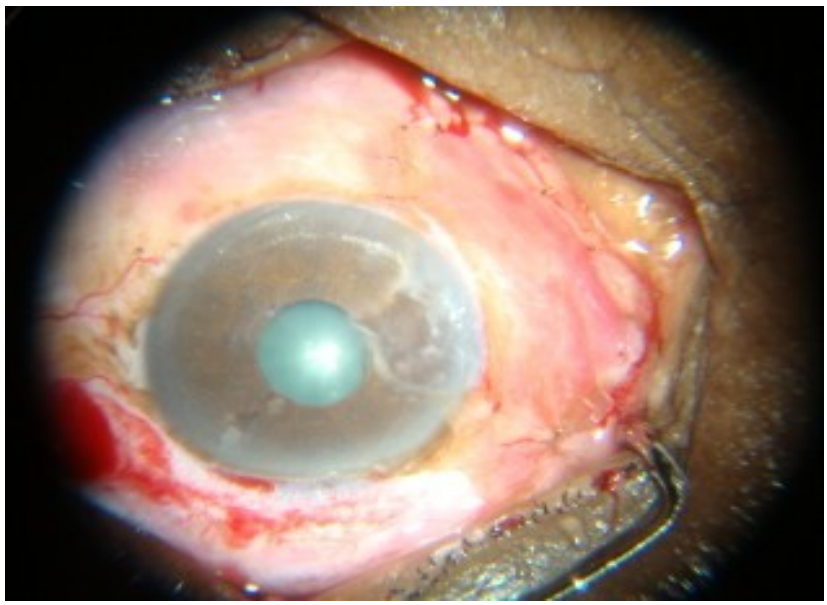


PSEUDOPTERYGIUM

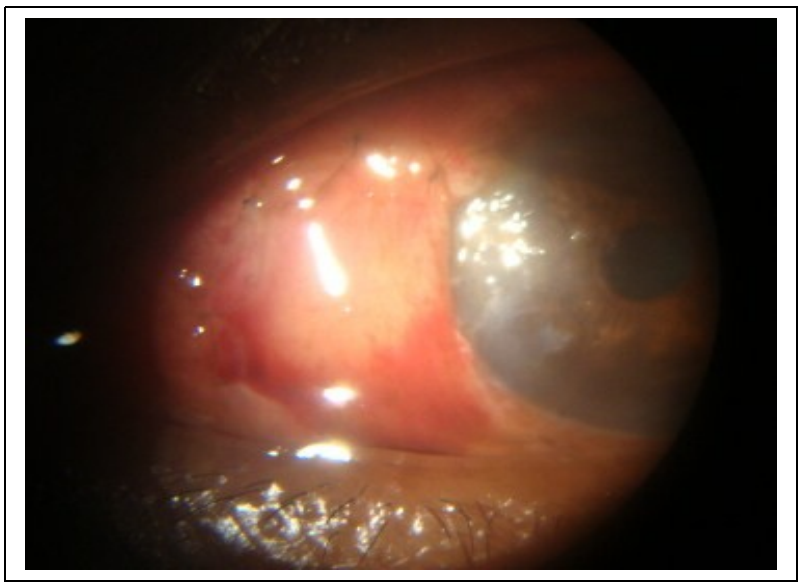
MEREST SCLERA TECHNIQUE



LIMBAL CONJUNCTIVAL AUTOGRAFT TRANSPLANTATION



GRAFT OEDEMA

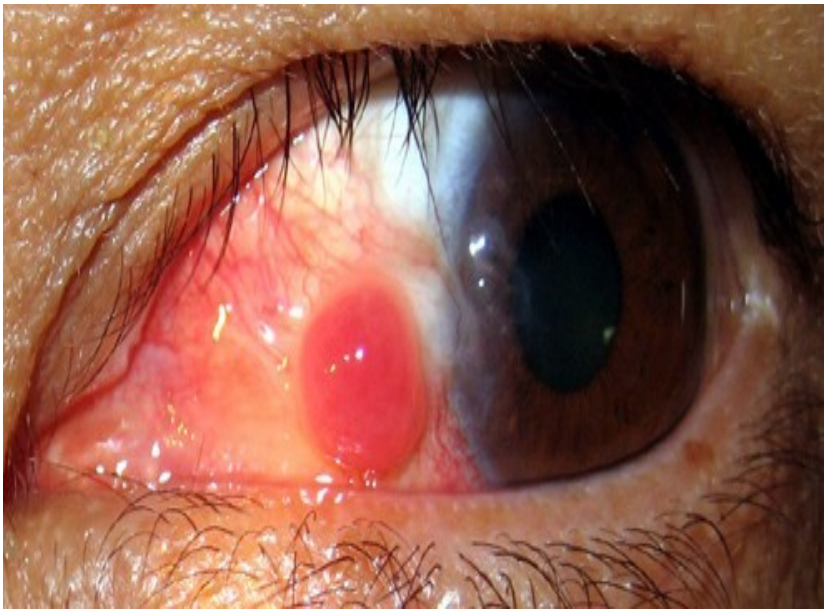


GRAFT RETRACTION

GRANULOMA FORMATION

AT DONOR SITE

AT HOST SITE



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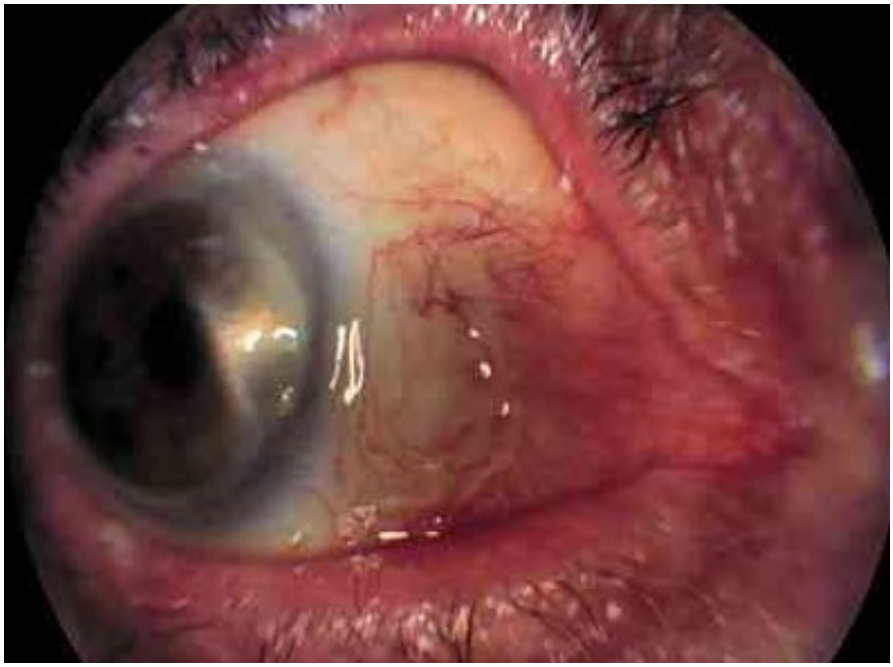
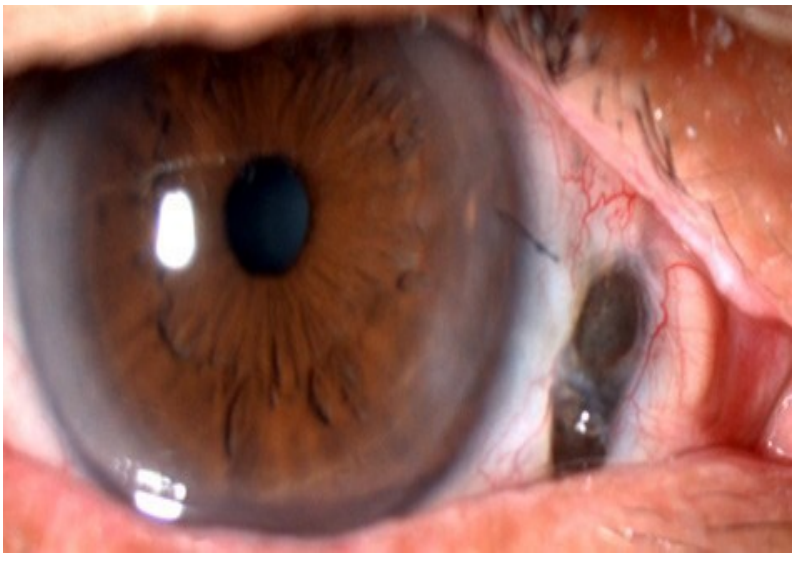
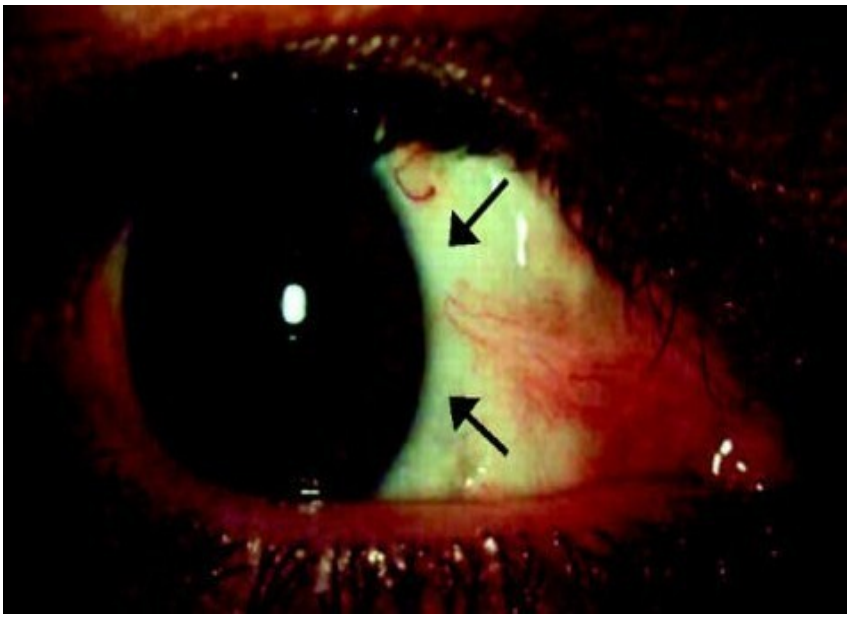


C

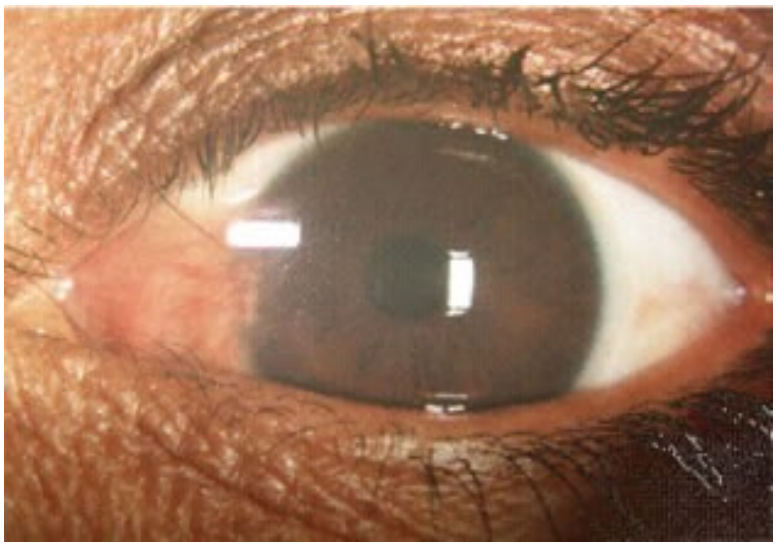


C

AVASCULARITY NEAR LIMBUS WITH MITOMYCIN C



BEFORE LCAT



AFTER LCAT (6 MONTHS)

PROFORMA

CASE NO :

NAME : AGE : IP NO :

OCCUPATION : SEX :

RIGHT EYE : LEFT EYE :

TOTAL NO OF HOURS SPENT OUTDOORS IN DAYLIGHT

PERSONS USING UMBRELLA / CAP / CLOTH

SYMPTOMS OF

- OCULAR IRRITATION
- RECURRENT INFLAMMATION
- VISUAL IMPAIRMENT
- COSMETIC DISFIGUREMENT

TYPE OF PTERYGIUM

- PRIMARY
- RECURRENT

GRADE OF PTERYGIUM

- T1
- T2
- T3

LOCATION OF PTERYGIUM

- NASAL
- TEMPORAL

- DOUBLE HEAD

EXTENSION OF PTERYGIUM

- RE

- LE

SIZE IN MILLIMETER

- RE

- LE

LID CLOSURE

- COMPLETE

- INCOMPLETE

ORBIT

- NORMAL

- ABNORMAL

SLIT LAMP EXAMINATION

- GRADING DONE ACCORDING TO THE RELATIVE TRANSLUCENCY OF BODY OF PTERYGIA.

- SIGNS OF DRY EYE / OTHER ADNEXAL PROBLEMS WAS RULED OUT

DILATED REFRACTION OF BOTH EYES.